# Centripetal Problems

1) A car whose mass is 1400 kg is driven at a constant speed of 30 m/s around a banked track whose radius is 100 m. a) What is the centripetal force exerted on the car? b) What is the F_y, the centripetal force provided by the car and the F_{normal} provided by the track? c) At what angle would the track be made so no friction is needed for the car to travel through the banked curve?

b)

$F_c = \dfrac{mv^2}{r}$

$= \boxed{12.6 kN}$

ba)
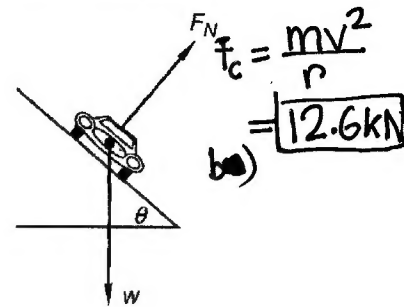
2) A truck is driven at 60 m/s around a banked turn with a radius of 250 m. a) What is the centripetal force on the truck if the truck weighs 1500 N? b) Find the magnitude of the normal force, F_N. c) If no frictional forces are present, find the angle of the track.
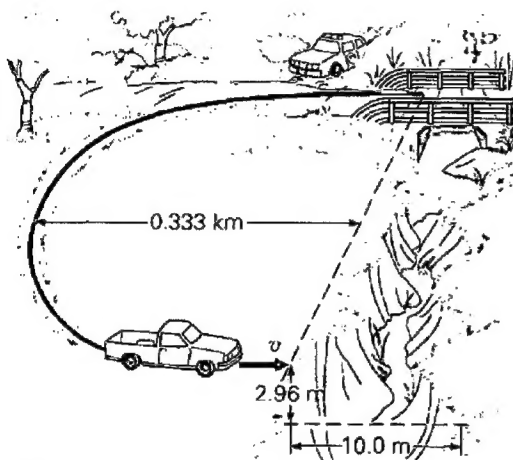
3) For a scene in a movie (Fluffy's Big Adventure), a stunt cat drives a 1.5×10^3 pickup truck with a length of 4.25 m around a circular curve with a radius of curvature of .333 km. The truck is to curve off the road, jump across a gully 10 m wide, and land on the other side 2.96 m below the initial side. What is the minimum centripetal acceleration the truck must have in going around the circular curve to clear the gully and land on the other side?

—0.333 km—

2.96 m

10.0 m

4) A block of mass m slides down an inclined plane into a loop-the-loop of radius r. a) Neglecting friction, what is the minimum speed the block must have at the highest point of the loop in order to stay in the loop? (Hint: What force must act on the block at the top of the loop to keep the block on a circular path? b) At what vertical height on the inclined plane (in terms of the radius of the loop) must the block be released if it is to have the required minimum speed at the top of the loop?